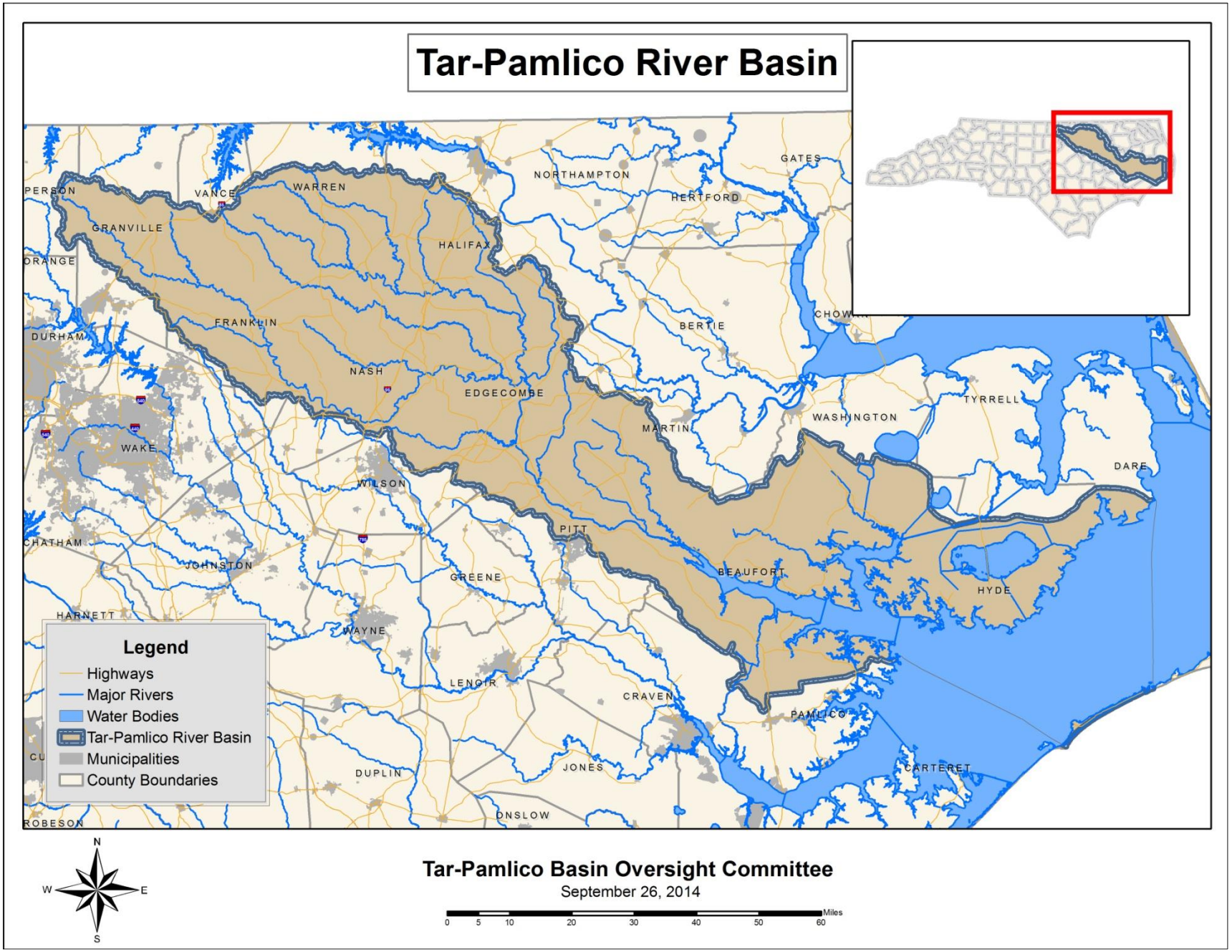
NCDA&CS

2016 Annual Progress Report (Crop Year 2015) on the Tar-Pamlico Agricultural Rule (15A NCAC 02B .0256)

A Report to the Environmental Management Commission from the Tar-Pamlico Basin Oversight Committee: Crop Year 2015


Tar-Pamlico River Basin
PERSON
VANCE
WARREN
GRANVILLE
ORANGE
FRANKLIN
DURHAM
NASH
WAKE
WILSON
CHATHAM
JOHNSTON
HARNETT
WAYNE
GREENE
LENOIR
DUPLIN
JONES
ONSLOW
ROBESON
CRAVEN
PAMLICO
CARTERET
PITT
BEAUFORT
MARTIN
EDGECOMBE
HALIFAX
NORTHAMPTON
HERTFORD
GATES
BERTIE
WASHINGTON
TYRRELL
DARE
HYDE
Legend
Highways
Major Rivers
Water Bodies
Tar-Pamlico River Basin
Municipalities
County Boundaries
N
W
E
S
Tar-Pamlico Basin Oversight Committee
September 26, 2014
0 5 10 20 30 40 50 60
Miles

Summary

The Tar-Pamlico Basin Oversight Committee (BOC) received and approved crop year[1] (CY) 2015 annual reports from the fourteen Local Advisory Committees (LACs) operating under the Tar-Pamlico Agriculture Rule as part of the Tar-Pamlico Basin Nutrient Management Strategy. The report demonstrates agriculture's ongoing collective compliance with the Tar-Pamlico Agriculture Rule and estimates further progress in decreasing nutrient losses. In CY2015, agriculture collectively achieved an estimated 58% reduction in nitrogen loss compared to the 1991 baseline, continuing to exceed the rule-mandated 30% reduction. Thirteen of the 14 LAC's exceeded the 30% reduction goal established by the BOC. The main reason for the greater nitrogen reduction in these counties is shifts to crops with lower nitrogen demands and application rates. Phosphorus tracking in the basin indicates less risk of phosphorus loss during CY2015 than in the baseline year for 8 of the 9 qualitative indicators.

Rule Requirements and Compliance History

Tar-Pamlico NSW Strategy

The Environmental Management Commission (EMC) adopted the Tar-Pamlico nutrient strategy in 2000. The management strategy built upon the precedent-setting Neuse River Basin effort established three years earlier, which for the first time set regulatory reduction measures for nutrients on cropland acres in the state. The NSW strategy goal is to reduce the average annual load of nitrogen to the Pamlico estuary by 30% from 1991 levels and to limit phosphorus loading to 1991 levels. Mandatory controls were applied to address non-point source pollution in agriculture, urban stormwater, nutrient management, and riparian buffer protection. As of 2016, the Pamlico estuary is still classified as impaired and is not meeting its 30 percent nitrogen loading reduction goals.

Effective September 2001, the Tar-Pamlico Nutrient Sensitive Waters Management Strategy (NSW) provides for a collective strategy for farmers to meet the 30% nitrogen loss reduction and no-increase phosphorus goals within five years. A BOC and fourteen LACs were established to implement the rule and to assist farmers with complying with the rule.

All fourteen Local Advisory Committees (LACs) submitted their first annual report to the BOC in November 2003, which collectively estimated a 39% nitrogen loss reduction, and 10 of 14 LACs exceeded the 30% individually. Collective reductions gradually increased in succeeding years, and by CY2007 only one LAC was shy of the 30% individually.

Division of Soil and Water Conservation staff uses input from the LACs to calculate their annual reductions using the Nitrogen Loss Estimation Worksheet (NLEW). All fourteen LACs met as required in 2016, and based on their input the collective reduction of 58% exceeded the mandated 30% in CY2015. One county fell below the 30% goal established by the BOC (Martin).

[1] The 2015 crop year began in October 2014 and ended in September 2015.

Scope of Report and Methodology

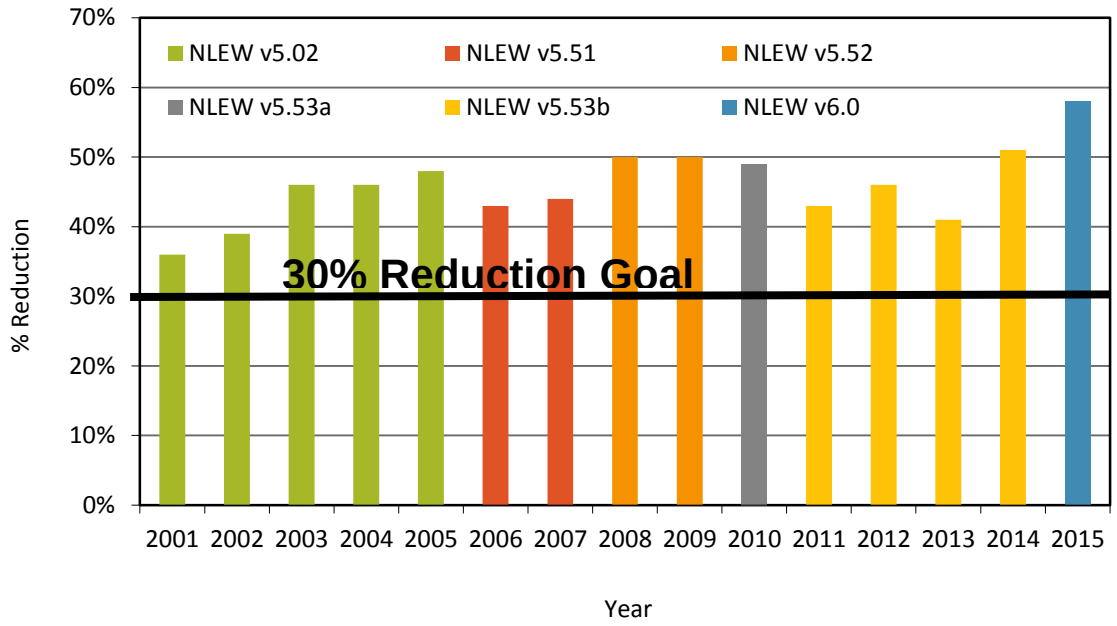
The estimates provided in this report represent whole-county scale calculations of nitrogen loss from cropland agriculture in the basin made by Division of Soil and Water Conservation staff using the 'aggregate' version of NLEW, an accounting tool developed to meet the specifications of the Neuse Rule and approved by the EMC for use in the Tar-Pamlico Basin. The development team included interagency technical representatives of the NC Division of Water Resources (DWR), NC Division of Soil and Water Conservation (DSWC), USDA-NRCS and was led by NC State University Soil Science Department faculty. NLEW captures application of both inorganic and animal waste sources of fertilizer to cropland. It is an "edge-of-management unit" accounting tool that estimates changes in nitrogen loss from croplands, but does not estimate changes in nitrogen loading to surface waters. An assessment method was developed for phosphorus, approved by the EMC, and is described later in the report.

Annual Estimates of N Loss and the Effect of NLEW Refinements

The NLEW software is periodically revised to incorporate new knowledge gained through research and improvements to data. These changes have incorporated the best available data, but changes to NLEW must be considered when comparing nitrogen loss reduction in different versions of NLEW. Further updates in soil management units are expected as NRCS produces updated electronic soils data. The small changes in soil management units are unlikely to produce significant effects on nitrogen loss reductions.

In 2016 the Division of Soil and Water Conservation worked with NC State University, NCDA&CS Emergency Programs staff, and the NCSU Cooperative Extension Service to update NLEW software into a web-based platform that incorporates updated yield expectations and nitrogen use efficiencies for crops. The NLEW software has been updated from outdated programming language and is now being housed on NCDA&CS servers. As a result of this change, sweet potatoes, which were excluded from CY2014 reporting, have been added back into the crop reports for current and baseline years, while other specialty crops, like white potatoes, remain excluded due to a lack of research data to determine a North Carolina-specific nitrogen use efficiency. The crops not included are grown on a small number of acres in the basin and are therefore a minimal contributor to overall nitrogen loss from agriculture. Other beneficial updates include server storage of annual reports, streamlined data export, and ongoing end-user data maintenance capabilities, which should enable DSWC and the BOC to incorporate new realistic yield expectations and nitrogen use efficiencies quickly and efficiently as future research is released and refined. Figure 1 represents the annual percent nitrogen loss reduction from the baseline for 2001 to 2015.

Figure 1. Collective Cropland Nitrogen Loss Reduction Percent 2001 to 2015, Tar Pamlico River Basin.



The first NLEW reports were run in 2001, and agriculture has continued to exceed its collective 30% nitrogen reduction goal since that time. The first NLEW revision (v5.51) updated soil management units and marked a significant change in the nitrogen reduction efficiencies of buffers, so both the baseline and CY2005 were re-calculated based on the best available information. The second (v5.52) and third (v5.53a) revisions were administrative and included minor updates to soil mapping units and realistic yields. In April of 2011 the NLEW Committee established further reductions (v5.53b) in nitrogen removal efficiencies for buffers based on additional research. As mentioned above, in 2016 NLEW software was updated (v6.0) from outdated software and transferred to a web-based platform on NCDA&CS servers. Revised realistic yield and nitrogen use efficiency data from NCSU was incorporated, and some minor calculation errors were corrected for corn and sweet potatoes. Table 1 lists the changes in buffer nitrogen reduction efficiencies over time.

Table 1. Changes in Buffer Width Options and Nitrogen Reduction Efficiencies in NLEW

Buffer Width	NLEW v5.02* % N Reduction 2001-2005	NLEW v5.51, v5.52, v5.53a % N Reduction 2006-2010	NLEW v5.53b, v6.0 % N Reduction 2011-Current
20'	40% (grass) 75% (trees & shrubs)	30%	20%
30'	65%	40%	25%
50'	85%	50%	30%
70'	85%	55%	30%
100'	85%	60%	35%

**NLEW v5.02 - the vegetation type (i.e. trees, shrubs, grass) within 20' and 50' buffers determined reduction values. Based on research results, this distinction was dropped from subsequent NLEW versions.*

Current Status

Nitrogen Reduction from Baseline for CY2015

All fourteen LACs submitted their fifteenth annual report to the BOC in August 2016. For the entire basin, in CY2015 agriculture achieved a 58% reduction in nitrogen loss compared to the 1991 baseline. This year 13 of the 14 LACs achieved the at-least 30% nitrogen loss reduction goal set by the BOC. Table 2 lists each county's baseline, CY2014 and CY2015 nitrogen (lbs/yr) loss values, and nitrogen loss percent reductions from the baseline in CY2014 and CY2015.

*Table 2. Estimated Reductions in Agricultural Nitrogen Loss from Baseline (1991) for CY2014 and CY2015, Tar-Pamlico River Basin**

County	Baseline N Loss (lb)* NLEW v6.0	CY2014 N Loss (lb) † NLEW v5.53b	CY2014 N Reduction (%) NLEW † v5.53b	CY2015 N Loss (lb)* NLEW v5.33b	CY2015 N Reduction (%) NLEW v5.33b
Beaufort	9,178,262	5,526,800	40%	4,244,911	54%
Edgecombe	5,037,742	2,601,962	48%	2,630,701	48%
Franklin	2,183,680	468,974	78%	445,045	80%
Granville	890,371	160,730	82%	128,408	86%
Halifax	2,902,105	1,471,470	47%	1,488,405	49%
Hyde	5,501,161	3,222,700	35%	2,335,580	58%
Martin	782,152	567,557	27%	564,012	28%
Nash	4,693,868	1,118,526	74%	1,430,501	70%
Person	153,228	55,425	64%	70,349	54%
Pitt	6,229,921	2,706,244	56%	2,391,709	62%
Vance	419,485	131,930	69%	96,401	77%
Warren	535,517	159,204	70%	108,974	80%
Washington	939,912	453,491	47%	432,816	54%
Wilson	890,691	346,689	59%	428,189	52%
Total	40,338,095	18,991,702†	51%†	16,796,001	58%

**Nitrogen loss values are for comparative purposes. They represent nitrogen that was applied to agricultural lands in the basin and neither used by crops nor intercepted by BMPs in a Soil Management Unit, based on NLEW calculations. This is not an in-stream loading value.*

† *CY2014 values were calculated with sweet potato acres removed from current and baseline year figures. The numbers shown were copied from the 2015 report for the sake of consistency, but the CY2014 reductions shown cannot be compared to the baseline nitrogen loss shown in the table, which was calculated using NLEW v6.0 and includes sweet potatoes.*

Nitrogen loss reductions were achieved through the combination of fertilization rate decreases, cropping shifts, BMP implementation, and cropland acreage fluctuation. In addition to wet weather, the most significant factor is shifts from crops which require high nitrogen inputs to crops which require little or no nitrogen. Martin County's individual nitrogen reduction of 28% is below the BOC's county goal of 30% due mostly to cropping shifts and the fact that the county has only reduced cropland acres by 2,212 from baseline. This county saw wheat decrease by 2,175 acres while soybeans, which require lower nitrogen inputs, increased by 1,077 acres. The Division of Soil and Water Conservation will support the LAC in encouraging

BMP implementation in order to increase their reduction. Overall, NLEW estimates the following factors contributed to the total nitrogen loss reduction according to the percentages shown in Table 3.

*Table 3. Factors that Influence Nitrogen Reduction by Percentage on Agricultural Lands, Tar-Pamlico River Basin**

Factor	CY2012 NLEW v5.53b	CY2013 NLEW v5.53b	CY2014 NLEW v5.53b	CY2015 NLEW v6.0
BMP implementation	10%	8%	12%	14%
Fertilization Management	17%	20%	18%	15%
Cropping shift	10%	6%	10%	17%
Cropland converted to grass/trees	5%	5%	5%	5%
Cropland lost to idle land	4%	1%	5%	6%
Cropland lost to development	1%	1%	1%	1%
TOTAL	46%	41%	51%	58%

**Percentages are based on a total of the reduction, not a year-to-year comparison.*

BMP Implementation

As illustrated in Figure 2, CY2015 yielded a net increase of 68 acres affected by water control structures and a decrease of 1,653 acres of nutrient scavenger crops, while buffer acres increased by 21.

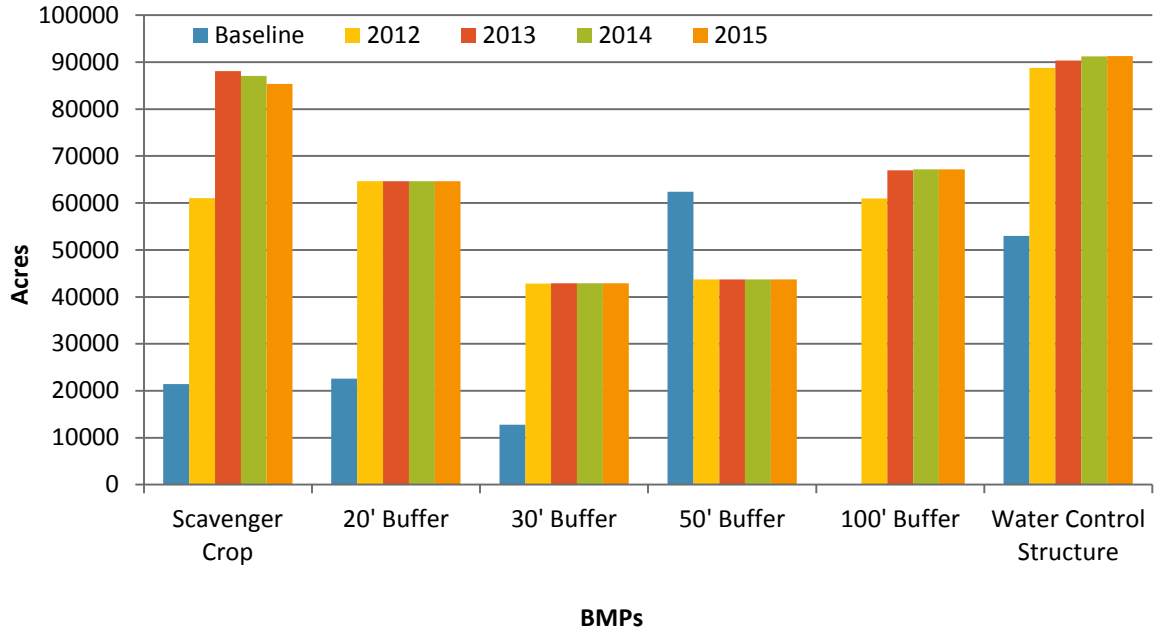
The Division of Soil and Water Conservation, Soil and Water Conservation Districts and Natural Resources Conservation Service staff continue to make refinements to the NLEW accounting process as opportunities arise. The BMP data is collected from state and federal cost share program active contracts, and in some cases BMPs that were installed without cost share funding. While there is some opportunity for variability in the data reported, LACs are including data that is the best information currently available. As additional sound data sources become available, the LACs will review these sources and update their methodology for reporting if warranted.

Overall, the total acres of implementation of BMPs have increased since the baseline, as illustrated in Figure 2. When actual acres of BMPs installed through federal, state and local cost share programs are compared to the total cropland (614,715 acres), over half of all reported cropland receives some kind of BMP treatment. The treatment estimate is probably greater, however, because it does not take into account the entire drainage area treated by buffers in the piedmont, which is generally 5 to 10 times higher than the actual acres of the buffer shown in Figure 2.[2]

[1] **Bruton, Jeffrey Griffin. 2004. Headwater Catchments: Estimating Surface Drainage Extent Across North Carolina and Correlations Between Landuse, Near Stream, and Water Quality Indicators in the Piedmont Physiographic Region. Ph.D.**

From 2001 through 2006, the NLEW program captured buffers 50’ and wider as one category. After the 2007 update, categories for 70’ and 100’ buffers were added. In CY2006 the buffers larger than 50’ were redistributed into these new categories. If this redistribution had not occurred the 50’ buffer acres would have been higher in subsequent years.

*Figure 2: Nutrient Reducing BMPs Present on Agricultural Lands for Baseline (1991) and Installed from 2012-2015, Tar-Pamlico River Basin**



**The acres of buffers listed represent actual acres. Acres affected by the buffer could be 5 to 10 times larger in the Piedmont than the acreage shown above*[1]

Additional Nutrient BMPs

At the field level, a number of BMPs contribute to nutrient reduction and subsequent water quality improvement. Not all BMP types are tracked by NLEW. These include: livestock-related nitrogen and phosphorus reducing BMPs, BMPs that reduce soil and phosphorus loss, and BMPs that do not have enough scientific research to support estimating a nitrogen benefit. The BOC believes it is worthwhile to recognize these practices. Table 4 identifies BMPs not accounted for in NLEW and tracks their implementation in the basin since CY2012.

Increased implementation numbers are evident in CY2015 across all BMP types since the baseline. Some of these BMPs will yield reductions in nitrogen loss that are not reflected in the NLEW accounting in this report but will benefit the estuary.

Dissertation. Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27606.http://www.lib.ncsu.edu/theses/available/etd-03282004-174056/

*Table 4: Nutrient-Reducing Best Management Practices Not Accounted for in NLEW, 2012-2015, Tar-Pamlico River Basin**

BMP	Units	2012	2013	2014	2015
Diversion	Feet	398,291	425,596	428,696	433,166
Fencing (USDA Programs)	Feet	241,732	256,384	256,384	261,884
Field Border	Acres	1,264	1,284	1,289	1,297
Grassed Waterway	Acres	2,475	2,518	2,524	2,569
Livestock Exclusion	Feet	233,061	238,676	238,676	239,281
Sod Based Rotation	Acres	52,502	70,456	70,596	80,836
Tillage Management	Acres	46,808	52,185	52,428	55,878
Terraces	Feet	371,936	371,936	371,936	371,936

**Values represent active contracts in State and Federal cost share programs.*

Fertilization Management

Both increased fertilizer cost and better nutrient management have resulted in farmers in the Tar-Pamlico River Basin reducing their nitrogen application from baseline levels. Figure 3 indicates that nitrogen rates for the major crops in the basin have reduced from the baseline period.

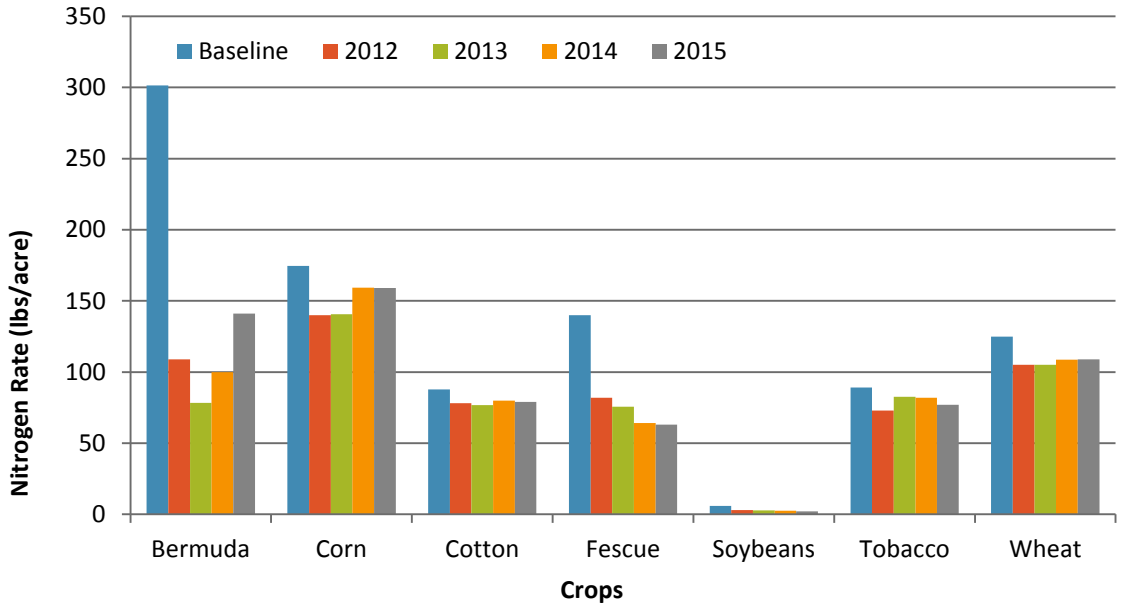
In CY2015 nitrogen rates were stable for corn, cotton, fescue, soybeans, and wheat, increased for bermuda, and decreased for tobacco compared to CY2014. Most pastures are under-fertilized throughout the Tar-Pamlico basin. The pasture and hayland are typically not supplemented with inorganic fertilizers.

Factors Identified by LACs Contributing to Reduced Nitrogen Rates since the Baseline Year

- Rising fertilizer costs and fluctuating farm incomes.
- Increased education & outreach on nutrient management (NC Cooperative Extension holds an annual nutrient management training session, since 2004 approximately 2,000 farmers and applicators have received training.)
- Mandatory waste management plans
- The federal government tobacco quota buy-out reducing tobacco acreage.
- Neuse & Tar-Pamlico Nutrient Strategies.

With increasing fertilizer prices, there has been an economic incentive for producers to consider more efficient nitrogen rates, timing, and placement alternatives. Fertilizer rates and standard application practices are revisited annually by LACs using data from farmers, commercial applicators and state and federal agencies' professional estimates.

Figure 3. Average Annual Nitrogen Fertilization Rate (lb/ac) for the Major Agricultural Crops for the Baseline (1991) and 2012-2015, Tar-Pamlico River Basin

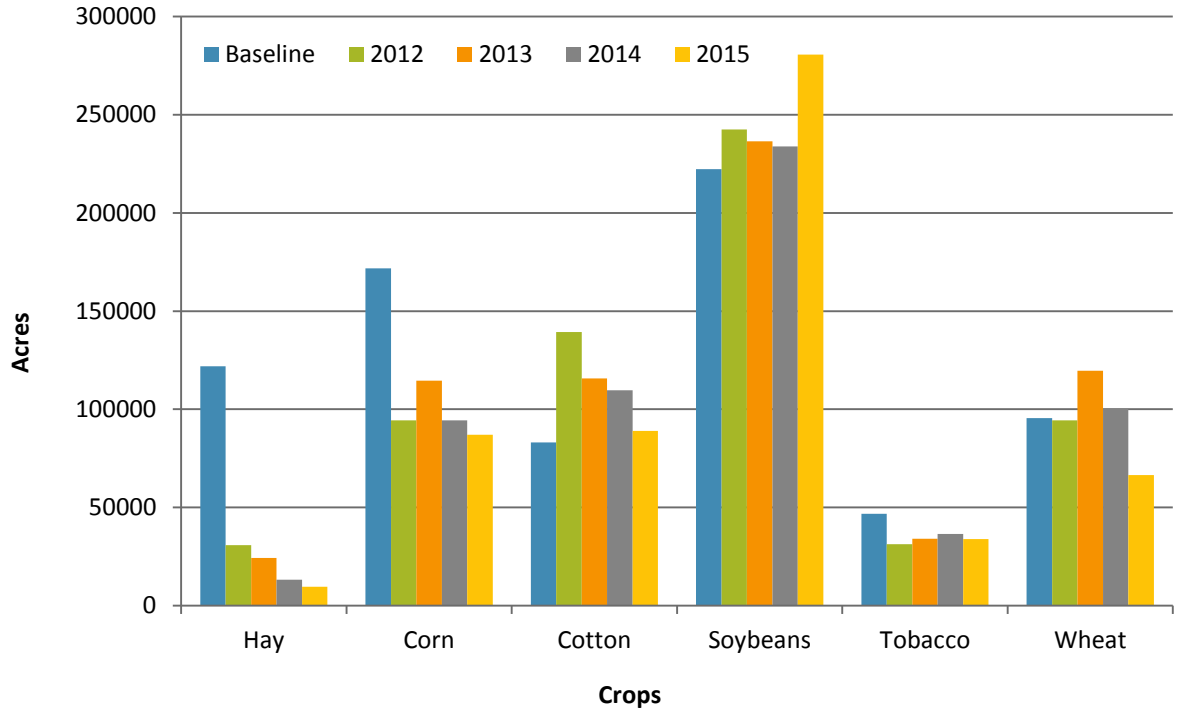


Cropping Shifts

The LACs calculated the cropland acreage by utilizing crop data reported by farmers to the USDA-Farm Service Agency. Each crop requires different amounts of nitrogen and utilizes the nitrogen applied with different efficiency rates. Changes in the mix of crops grown can have a significant impact on the cumulative yearly nitrogen loss reduction. The BOC anticipates that the basin will see additional crop shifts in the upcoming year based on changing commodity prices and wet weather.

Figure 4 shows crop acres and shifts for the last four years compared to the baseline. Some crops have remained relatively stable, while others show more volatility. Cotton prices have fallen almost 56% from a 2011 peak, so cotton acreage continued a steady decline in CY2015. In addition, low corn prices resulted in a reduction of corn acreage, with some of the reduction likely resulting in a soybean increase of 46,735 acres. However, a recent corn price increase is expected to result in an increase in corn acres for CY2016, so it is unclear which of these trends will continue. In addition, an extremely wet fall prevented many farmers from accessing their fields in time to plant a crop of winter wheat. In most cases wheat acres are "double cropped" with soybeans, which means that wheat acres are planted on the same acreage before a spring soybean crop. In CY2015, soybean acreages were accounted for in these double cropped systems, but some of those acres were not fertilized over the winter months where a wheat crop was not planted. This resulted in an overall decrease of almost 34,000 wheat acres between CY2014 and CY2015. A host of factors from individual to global determine crop choices.

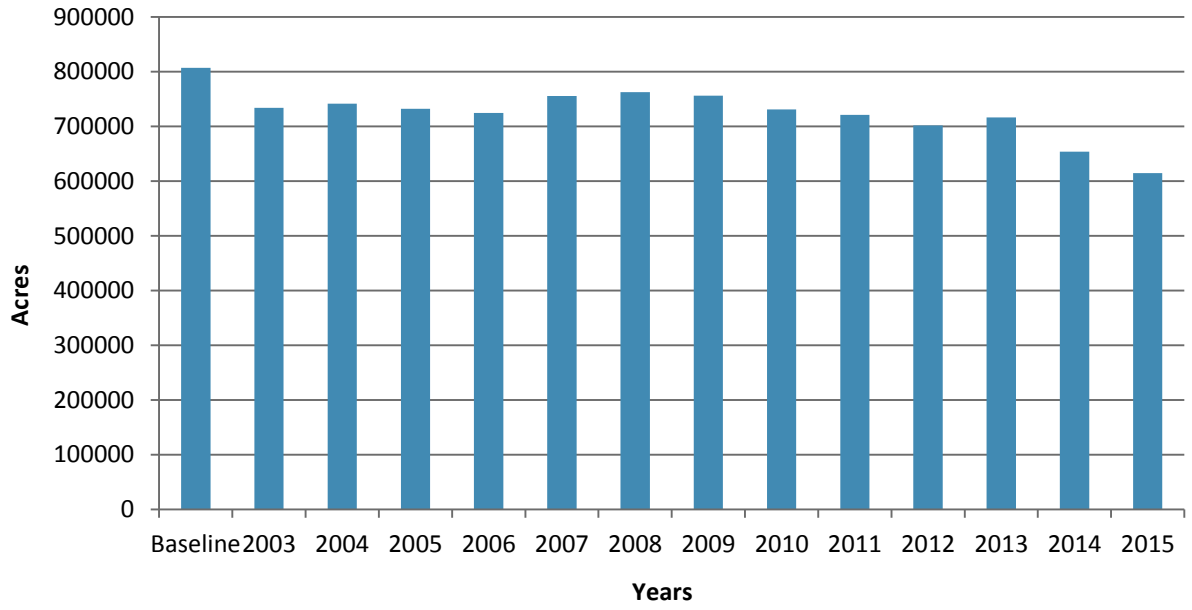
Figure 4. Acreage of Major Crops for the Baseline (1991) and 2012-2015, Tar-Pamlico River Basin



Land Use Change to Development, Idle Land and Cropland Conversion

The number of cropland acres fluctuates every year in the Tar-Pamlico River Basin due to cropland conversion, idle land and development. Each year, some cropland is permanently lost to development or converted to grass or trees and likely to be ultimately lost from agricultural production. Idle land is agricultural land that is currently out of production but could be brought back into production at any time. Currently it is estimated that approximately 12,650 acres have been permanently lost to development in the basin and more than 47,007 acres have been converted to grass or trees since the 1991 baseline. For CY2015 it is estimated that there are approximately 52,955 idle acres. There is a total of 614,715 NLEW-accountable acres of cropland (see Fig. 5). In addition to these changes, LACs have noted that over 2,556 cropland acres have been lost to newly leased and constructed solar farms. This total will be updated in future years, but it is uncertain if this should be considered a permanent or temporary loss of cropland. If a landowner terminates a lease after the 30-year contract expires, it is possible that the land may be returned to its previous use. All of the above estimates come from the LAC members' best professional judgment, USDA-FSA records and county planning department data. The total crop acres are obtained from USDA-FSA and NC Agricultural Statistics annual reports. Cropland acres have continued to decrease from the baseline period (see Figure 5).

Figure 5. NLEW-Accounted Cropland Acres in the Tar-Pamlico River Basin, Baseline (1991) and 2003-2015



Phosphorus

Phosphorus Indicators for CY2015: The qualitative indicators included in Table 5 show the relative changes in land use and management parameters and their relative effect on phosphorus loss risk in the basin. This approach was recommended by the Phosphorus Technical Advisory Committee (PTAC) in 2005 due to the difficulty of developing an aggregate phosphorus tool parallel to the nitrogen NLEW tool and was approved by the EMC. Table 5 builds upon the data provided in the 2005 PTAC report, which included all available data at the time ending with data from 2003. This report adds phosphorus indicator data for CY2012 through CY2015. With the exception of animal waste P, all other parameters indicate less risk of phosphorus loss than in the baseline year.

Phosphorous Technical Assistance Committee (PTAC)

The PTAC's overall purpose was to establish a phosphorus accounting method for agriculture in the basin. It determined that a defensible, aggregated, county-scale accounting method for estimating phosphorus losses from agricultural lands is not currently feasible due to "the complexity of phosphorus behavior and transport within a watershed, the lack of suitable data required to adequately quantify the various mechanisms of phosphorus loss and retention within watersheds of the basin, and the problem with not being able to capture agricultural conditions as they existed in 1991". The PTAC instead developed recommendations for qualitatively tracking relative changes in practices in land use and management related to agricultural activity that either increase or decrease the risk of phosphorus loss from agricultural lands in the basin on an annual basis.

Contributing to the reduced risk of phosphorus loss is the increase of nutrient reducing BMPs in the basin. As indicated in Table 5, the acres affected in the basin by water control structures have steadily increased over the past three years. It should also be noted that the soil test phosphorus median number reported for the basin fluctuates each year due to the nature of how the data is collected and compiled. The soil test phosphorus median numbers shown in Table 5 are generated by using North Carolina Department of Agriculture

and Consumer Services (NCDA&CS) soil test laboratory results from voluntary soil testing and the data is reported by the NCDA&CS. The number of samples collected each year varies. The data only includes samples submitted for cropland. It does not include soil tests that were submitted to private laboratories. The soil test results from the NCDA&CS database represent data from entire counties in the basin, and have not been adjusted to include only those samples collected in the river basin area.

Table 5. Relative Changes in Land Use and Management Parameters and their Relative Effect on Phosphorus Loss Risk in the Tar-Pamlico

Parameter	Units	Source	1991 Baseline	CY 2012	CY 2013	CY2014	CY2015	1991 - 2015 Change	CY2015 P Loss Risk +/-
Agricultural land	Acres	FSA	807,026	702,227	716,289	653,954	614,715	-24%	-
Cropland conversion (to grass & trees)	Acres	USDA-NRCS & NCACSP	660	42,330	46,647	46,837	47,007	7022%	-
CRP / WRP (cumulative)	Acres	USDA-NRCS	19,241	41,833	41,833	41,833	41,833	117%	-
Conservation Tillage * (cumulative)	Acres	USDA-NRCS & NCACSP	41,415	46,808	52,185	52,428	55,878**	35%	-
Vegetated buffers (cumulative)	Acres	USDA-NRCS & NCACSP	50,836	212,212	218,236	218,419	218,440	330%	-
Water control structures (cumulative)	Acres Affected	USDA-NRCS & NCACSP	52,984	88,755	90,356	91,240	91,308	72%	-
Scavenger crop	Acres	LAC	13,272	73,177	92,269	83,700	85,380	543%	-
Animal waste P	lbs of P/ yr	NC Ag Statistics	13,597,734	16,561,052	16,880,526	14,530,827	15,013,151	10%	+
Soil test P median	P Index	NCDA&CS	83	85	85	81	79	-5%	-

** Conservation tillage is being practiced on additional acres but this number only reflects active cost share contract acres, not acres where contracts have expired or where farmers have implemented conservation tillage without cost share assistance.*

***According to the 2012 Ag Census, conservation tillage (including no-till) was practiced on 420,550 crop acres in the Tar-Pamlico River Basin.[3]*

Based on the these findings, the BOC recommends that no additional management actions be required of agricultural operations in the basin at this time to comply with the "no net increase above the 1991 levels" phosphorus goal of the agriculture rule. The BOC will continue to track and report the identified set of qualitative phosphorus indicators to the EMC annually, and to bring any concerns raised by the results of this effort to the EMC's attention as they arise, along with recommendations for any appropriate action. The BOC expects that BMP implementation will continue to increase throughout the basin in future years, and notes that BMPs installed for nitrogen, pathogen and sediment control often provide significant phosphorus benefits as well.

[3] USDA NASS, 2012 Census of Agriculture, Census by Watershed (HUC 030201). Available at:
www.agcensus.usda.gov/ Publications/2012/Online_Resources/Watersheds/sag03.pdf

Looking Forward

The Tar-Pamlico BOC will continue to report on rule implementation, relying heavily on Soil and Water Conservation District staff to compile crop reports. The BOC continues to encourage counties to implement additional BMPs to further reduce nutrient losses.

Because cropping shifts are susceptible to various pressures, the BOC is working with LACs in all counties to continue BMP implementation that provides for a lasting reduction in nitrogen loss in the basin while monitoring cropping changes. Due to an extremely wet fall growing season in late 2015, the BOC expects reported wheat acre totals in CY2016 to remain low. Indications are that corn acreage will increase in CY2016 due to a price increase.

Basin Oversight Committee recognizes the dynamic nature of agricultural business.

- Changes in the world economies, energy or trade policies.
- Changes in government programs (i.e., commodity support or environmental regulations)
- Weather (i.e., long periods of drought or rain)
- Scientific advances in agronomics (i.e., production of new types of crops or improvements in crop sustainability)
- Plant disease or pest problems (i.e., viruses or foreign pests)
- Urban encroachment (i.e., crop selection shifts as fields become smaller)
- Age of farmer (i.e., as retirement approaches farmers may move from row crops to cattle)

Funding is an integral part in the success of reaching and maintaining the goal through technical assistance and BMP implementation. It is also important for data collection and reporting.

In 2001, grants funded a total of ten basin technicians and two basin coordinators in the Neuse and Tar-Pamlico River Basins. The technicians' primary responsibility was to assist farmers with BMP implementation. These technicians assisted existing county staff to expedite the installation of nutrient reducing BMPs in the basin. On June 30, 2015 the last technician funding was expended, and technician funding is no longer eligible for grant awards by funding entities in the state. Therefore, less technical assistance for BMP implementation is available. Ongoing responsibility for conservation practice planning and installation now depends on local staff that also have other duties.

At the present time there is also no funding for a basin coordinator. Part of the responsibilities of the technicians and basin coordinators was to assist with the reporting requirements for the Neuse and Tar-Pamlico Agriculture Rules. In addition to his other duties, an employee within the NCSA&CS Division of Soil and Water Conservation has been assigned the data collection, compilation and reporting duties for the Agriculture Rules for all existing Nutrient Sensitive Waters Strategies.

Farmers and agency staff personnel with other responsibilities serve on the LACs in a voluntary capacity. Without funding for technicians, the annual local progress reports fall on the LACs without local technical assistance to compile the data for the annual reports. Few currently serving LAC members were active during the stakeholder process for the Agriculture Rule, so some institutional knowledge about annual reporting requirements has been lost. As a result,

training of new Soil and Water Conservation District staff and LAC members regarding rule requirements and reporting is ongoing.

Now that watershed technician funding has been eliminated, a more centralized approach to data collection and verification is necessary. This evolving approach will involve GIS analysis and more streamlined FSA acreage documentation. The LACs will be trained to handle the new workload to the best of their ability. Because district staff has neither the time nor financial resources to synthesize county level data, this centralized approach will come at the expense of local knowledge. Annual agricultural reporting is required by the rules; therefore continued funding for the Division's remaining position is essential for compliance.

The BOC will consider data from relevant studies as they are completed and become available and will consider the results as they relate to nutrient loadings from land based sources and uses. Previously, funding was available for research on conservation practice effectiveness, realistic yields, and nitrogen use efficiencies. Due to eligibility changes and other funding constraints, it is unlikely that new data will be developed. Prior funding sources for such research, which provided much of the scientific information on which NLEW was based, are no longer available. Should new funding be made available, additional North Carolina-specific research information could be incorporated into future NLEW updates.

Significant progress has been made in agricultural nitrogen loss reduction, and the agricultural community consistently reaches its 30% reduction goal. However, the measurable effects of these BMPs on overall in-stream nitrogen reduction may take years to develop due to the nature of non-point source pollution. Nitrogen reduction values presented in this annual summary of agricultural reductions reflect "edge-of-management unit" calculations that contribute to achieving the overall 30% nitrogen loss reduction goal. Significant quantities of agricultural BMPs have been installed since the adoption and implementation of the nutrient management strategy, and agriculture continues to do its part towards achieving the overall goal of a 30% reduction of nitrogen delivered to the Pamlico estuary.